

# THE IMPACTS OF POLLINATOR ABUNDANCE ON BENEFITS FROM FACULTATIVE POLLINATION MUTUALISM

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## ABSTRACT

Partner abundance affects costs and benefits in obligate mutualisms, but its role in facultative partnerships is less clear. I investigated this topic in a small alpine pollination web in the Colorado Rocky Mountains consisting of two clovers, *Trifolium dasyphyllum* and *T. parryi*, that vary in specialization on a shared bumblebee pollinator, *Bombus balteatus*. I examined a) foraging choices of queen *B. balteatus* among the clovers and explanatory mechanisms behind observed foraging biases, b) how intraspecific and interspecific variation in pollination niche breadth impacts individual- to population-level plant responses to manipulated pollinator density, c) habitat-scale relationships between natural bumblebee colony abundance and clover reproductive rates, and d) the broader impacts of this research in the setting of an outreach program using pollinator gardens at a local high school.

Results showed that architectural trait differences between the clovers leading to differences in foraging efficiency likely mediate preference of *B. balteatus* for *T. parryi*. Because of bees' preferences and a dearth of co-pollinators, *T. parryi* benefits more than *T. dasyphyllum* from increases in *B. balteatus* density at the individual plant level, at life stages linking individual success with population growth, at population levels, and across habitats; however benefits even for *T. parryi* are not unlimited. In addressing the broader impacts of this research in a K-12 setting, I found that components of the participant teachers' beliefs about using outdoor classrooms mediated the implementation and outcome of planned activities.